The Phase III Expansion of the White Street Sanitary Landfill

Greensboro, North Carolina

Construction Permit Application

November 1995

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WHITE STREET SANITARY LANDFILL
GREENSBORO, NORTH CAROLINA

CONSTRUCTION PLAN REPORT

Prepared for:

The City of Greensboro

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Project No. 06770-021-018

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CONSTRUCTION PLAN REPORT

TABLE OF CONTENTS

INDEX OF SHEETS

CALCULATIONS

Table of Contents

SECTION 1.0
INTRODUCTION

1.1 Purpose

The purpose of this Construction Permit Application is to obtain a "Permit to Construct" for the new lined landfill unit known as Phase III of the White Street Landfill. This application has been prepared in general accordance with the requirements of North Carolina Administrative Code Title 15.A. Chapter 13, Subchapter 13.B., Section .1617(a)(1).

1.2 General

This Construction Permit Application includes several independent plans under one cover. The format of this Construction Permit Report generally follows the format found in the regulations. Other major documents contained within this application are referenced in appropriate locations.

1.3 Background

The City of Greensboro (City) owns and operates the White Street Landfill located within the boundaries and jurisdiction of the City of Greensboro. The landfill is east of U.S. Highway 29, at the east end of White Street. The landfill is surrounded principally by residential development to the west, south, and east, and undeveloped woods across North Buffalo Creek to the north.

Waste disposal activities in the area now known as the White Street Sanitary Landfill began in 1943, and primarily consisted of the burning of garbage and trash on the site. Burning operations ceased in the mid-1960's, and since that time waste has been buried on site. The current landfill property covers an area of approximately 767 acres. As constructed, the City of Greensboro's White Street Sanitary Landfill is divided into two Phases. Phase I is an 85-acre site that stopped receiving waste prior to 1978. The current fill area, Phase II, consists of approximately 135 acres. Of the 135 acres, approximately 45 acres were closed prior to 1991, and the remaining 90 acres are currently active.

1.4 Regulatory History

On May 5, 1987, the City of Greensboro was issued North Carolina Solid Waste Management Permit No. 41-03 for the White Street Landfill. On March 10, 1992, the permit was amended to allow a vertical expansion of the facility. North Carolina's adoption of "Subtitle D" regulations on October 9, 1993, placed additional requirements on the existing facility.

In April of 1994, a Transition Plan for Phase II was submitted to the state. In April 1995, a Site Study was prepared and submitted for the Phase III landfill expansion. In accordance with NC DEHNR regulations, this application is submitted in support of the City's request for a construction permit to construct the new proposed Phase III unit.

SECTION 2.0
FACILITY REPORT

2.1 Facility Report

The purpose of this section is to present a conceptual plan for the development of the proposed new lined landfill unit known as Phase III of the City of Greensboro's White Street Sanitary Landfill. This report has been prepared in accordance with the requirements of Rule .1619 of the North Carolina Solid Waste Management Rules and Solid Waste Management Law.

2.1.1 Facility Services

Currently, the following activities or services are provided at the White Street Sanitary Landfill:

- Scales/scalehouse facilities
- Administrative offices
- MSW landfill
- Yard waste processing facility
- Equipment maintenance facility

Work is currently underway (design or construction) for the following facilities:

- Lined landfill (three cells constructed over five years)
- Gas recovery facility (reference ongoing permitting by gas agency through NC DEHNR)

With construction of the new lined landfill, the following facilities will be added:

- Leachate management facility

2.1.2 Facility Boundary

Drawing C-1, Existing Conditions, shows the proposed facility boundary. The proposed boundary encompasses the Phase III landfill, a leachate management area and adequate buffers for monitoring.

2.1.3 Types of Waste

Waste which is received at the White Street Sanitary Landfill is categorized as residential, industrial, commercial, construction/demolition, and yard waste. The proposed Phase III facility will accept only residential, industrial, or commercial waste types. Separate areas of the White Street Sanitary Landfill have been designated to receive the construction/demolition waste and the yard waste which are brought to the facility. The yard waste is composted and the construction/ demolition waste is either recycled or disposed of in a separate C&D disposal area.

2.1.4 Disposal Rates and Estimated Variances

Municipal solid wastes anticipated to be received at the White Street Sanitary Landfill for the period 1994 - 2023 are summarized in Table 2-1. As indicated, the MSW stream is projected to grow from approximately 243,600 tons in 1994 to an estimated 384,800 tons in 2023. On a monthly disposal rate basis, these estimates calculate out to be approximately 20,300 tons per month in 1994 to 32,100 tons per month in 2023.

Historically, the quantities of MSW received at the White Street Sanitary Landfill on a month to month basis have been relatively constant. Typically, MSW generation has been highest during the month of August (on average, representing 10% of the annual MSW waste received), and the months of November and December have been the lowest in terms of MSW generation (on average, each month yielding 7% of the annual MSW waste received).

For the purposes of this Report, it has been assumed that waste generation rates shall increase at a rate of 1.3% per year during the years 1994 -2000 (U.S. EPA estimate); after the year 2000 it has been assumed that generation rates shall increase by 2.0% per year. Tonnage projections were not based on per capita

TABLE 2-1
MUNICIPAL SOLID WASTE PROJECTIONS
CITY OF GREENSBORO, WHITE STREET SANITARY LANDFILL

Year	Guilford Co. Pop.[1]	White Street Landfill		Guilford County MSW Tons/Year[4]
		MSW Tons/Year[3]	MSW Tons/Month	
1994	360,886	243,556[2]	20,296	363,557
1995	364,252	246,720	20,560	366,947
1996	366,423	249,890	20,824	369,135
1997	368,594	253,050	21,088	371,322
1998	370,765	256,220	21,352	373,509
1999	372,936	259,390	21,616	375,696
2000	375,107	262,550	21,879	377,883
2001	376,667	277,650	23,138	379,454
2002	378,227	282,520	23,543	381,026
2003	379,788	287,400	23,950	382,598
2004	381,348	292,270	24,356	384,170
2005	382,908	297,140	24,762	385,742
2006	384,530	302,010	25,168	387,376
2007	386,152	306,880	25,573	389,010
2008	387,773	311,750	25,979	390,643
2009	389,395	316,620	26,385	392,277
2010	391,017	321,490	26,791	393,911
2011	392,639	326,360	27,197	395,545
2012	394,261	331,240	27,603	397,179
2013	395,882	336,110	28,009	398,812
2014	397,504	340,980	28,415	400,446
2015	399,126	345,850	28,821	402,080
2016	400,748	350,720	29,227	403,714
2017	402,370	355,590	29,633	405,348
2018	403,991	360,460	30,038	406,981
2019	405,613	365,330	30,444	408,615
2020	407,235	370,200	30,850	410,249
2021	408,857	375,080	31,257	411,883
2022	410,479	379,950	31,663	413,517
2023	412,100	384,820	32,068	415,150

Notes:

1) Population based on 1990 U.S. Census and NC Office of State Planning projections for the years 1995, 2000, 2005, and 2010. Straight line interpolation used for intervening and subsequent years.

2) Based on White Street Sanitary Landfill data recorded for residential, commercial, and industrial waste (MSW) for period 1/1/94 - 12/31/94.

3) Using the MSW tonnage for 1994 as a base year, tonnage projections for subsequent years through 2000 calculated using the U.S. EPA projected increase in waste generation rate of 1.3%/year. Beyond the year 2000, waste generation rates reflect a 2.0% increase per year.

4) Waste projections using NC MSW per capita generation rate of 5.52 pounds per person per day (NC DEHNR, North Carolina Solid Waste Management Annual Report, July 1, 1992 - June 30, 1993) and Guilford County population projections.

generation rates, as it is known that not all waste generated within Guilford County is disposed of in the White Street Sanitary Landfill. For comparative purposes, MSW projections were made using the population estimates for Guilford County and the MSW per capita generation rate of 5.52 pounds per person per day, which was the estimated average for the state of North Carolina during fiscal year 1992-1993. As can be seen from the actual 1994 tonnage received at the White Street Sanitary Landfill, and that projected if the entire Guilford County population were to have disposed of 5.52 pounds of MSW per day, it is apparent that a portion of the County's MSW stream is being disposed of in facilities other than the White Street Sanitary Landfill, or that the per capita generation rate of 5.52 pounds per person per day is inaccurate for Guilford County. The actual 1994 waste stream and linear MSW generation growth rates were used for estimating future waste stream quantities for the purposes of this document.

2.1.5 Service Area

The White Street Sanitary Landfill will accept only those wastes which are generated within Guilford County and from municipalities whose boundaries cross into Guilford County. The waste stream received at the facility consists of approximately 80% municipal solid waste (residential, commercial, and industrial) which will be disposed of in Phase III, and 20% yard waste and construction/demolition waste. It is anticipated that this ratio of MSW to other wastes received at the proposed facility (Phase III) will remain relatively constant, as the service area will remain the same; namely, Phase III shall provide the City of Greensboro and Guilford County with lined landfill disposal capacity for MSW.

2.1.6 Procedures for Waste Segregation

As is currently the procedure for waste segregation, all vehicles arriving at the landfill will check in at the scalehouse, where the vehicle hauling the waste will be weighed. The Scale Attendant will request from the driver of the vehicle entering the landfill a description of the waste it is carrying to ensure that unacceptable waste is not allowed into the landfill. The Attendant will then visually check the vehicle as it crosses the scale. Signs will be conspicuously posted informing users of dumping procedures, the type of waste the facility is

permitted to receive, as well as those wastes banned from disposal at the facility, and shall indicate the location of the disposal area.

Vehicles hauling MSW for which the proposed Phase III facility is permitted to receive will either be directed to the working face of the landfill to dump their load, or, if selected for random waste inspection, will be directed to a lined area separate from the working face where trained landfill personnel will visually inspect the contents of the load. Any materials which pose health hazards, cause fire, or which could impact negatively on the environment will be deemed unacceptable. When unacceptable waste is detected at the scalehouse or in the random waste inspection area, the load will be rejected and not permitted to be dumped into the landfill. If unacceptable waste is found at the tipping area, identification of the truck or persons is made (if possible) and documented, then the unacceptable waste will be identified and removed from the landfill. If the waste is hazardous, it will be placed in a hazardous waste container and taken to a designated hazardous waste staging area for proper disposal. When this occurs, the event will be reported to Mr. Hugh Jernigan of the NC DEHNR Division of Solid Waste Management. Mr. Jernigan is the Waste Management Specialist assigned by the Winston-Salem Field Operations Branch office of the NC DEHNR Division of Solid Waste Management office who is assigned to monitor regulatory compliance at the White Street Sanitary Landfill.

Vehicles hauling yard waste or construction/demolition waste will deposit the contents of their loads in designated facility areas which are separate from the proposed Phase III facility. All C&D debris will be maintained in a location separate from the Phase III location and shall not be commingled with the normal municipal wast stream. In addition, yard waste shall be composted in a location separate from the Phase III location and shall not be commingled with the normal municipal solid waste stream.

2.1.7 Equipment Requirements

The White Street Landfill currently accepts a monthly average of 20,600 tons of refuse per day. The types and sizes of equipment currently in use at the landfill are presented in Table 2-2.

TABLE 2-2
CITY OF GREENSBORO, WHITE STREET SANITARY LANDFILL
CURRENT EQUIPMENT INVENTORY

Description	Make/Model	No.	Comment
Landfill Compactor	826C Cat	3	
Bulldozer	D8N Cat	2	
Grader	140G Cat	1	
Loader	WA250-1 Komatsu 1994 FR20B Fiat Allis	1 1	
Earthmover	627E Cat	2	
Excavator	K916LC-2 Kobelco	1	
Tractor	White	1	w/Lowboy Trailer
Dump Truck	D400D Cat	3	Off Road
Other Trucks	F250D HD Ford 1994 C70 Chevrolet 2500 Chevrolet 1989	1 1 1	 Fuel Truck Maint.
Other (specify):	900 Ford Cheyenne 1993 Chevrolet Ford 8000 Kubota L275 John Deere 2355 Toro Kawasaki Mule	1 1 1 1 1 1 1	Water Truck Maint. Maint. Utility Tractor w/Mower Lawn Mower Utility vehicle

The equipment on-site is currently managing refuse disposal operations with no apparent difficulties. When Phase III is ready to accept refuse, the existing equipment will use the same procedures and technique in spreading, compacting, and covering waste. In the event the waste stream increases significantly, the potential addition of equipment will be evaluated.

2.2 Landfill Capacity

2.2.1 Total Operating Capacity

The proposed Phase III facility boundary encompasses approximately 146 acres. Phase III consists of a 51-acre lined unit which will be divided into three construction cells of approximately 25, 14, and 12 acres, respectively (see Drawing No. C-2 - Subgrade Plan). This application is submitted for permit approval of the entire 51-acre Phase III area. The landfill system developed for Phase III is expected to contain common leachate and gas management facilities that will be operated during the regulated life of the proposed facility. Drawings in support of this permit application are included with this document. The plans provided are not for construction.

The total gross operating capacity for the Phase III area is estimated to be 5,140,000 cubic yards. The net capacity for waste is 3,885,000 cubic yards. The volume translates to approximately 87 months of life, using 22,300 tons per month (the average monthly tonnage based on projections from 1998 to 2002), a compaction factor of 1,000 pounds per cubic yard, and a 4:1 waste-to-cover ratio. Please refer to the attached calculations. An alternative daily cover may be pursued by the City. An alternative daily cover could increase the waste-to-soil ratio to 6.2:1, resulting in a net waste capacity of 4,181,000 cubic yards.

2.2.2 Operating Capacity for Each Cell Development

2.2.2.1 Cell 1 Development

Cell 1 of the lateral expansion has an estimated gross operating capacity of 1,740,000 cubic yards and a net waste capacity of 1,350,000 cubic yards. The area for Cell 1 is approximately 25 acres. Cell 1 is divided into six subcells. The life for Cell 1 is approximately 30 months.

Drawing No. C-5, Cell 1 Development, identifies the configuration of Cell 1. The initial placement of refuse will begin in the northeastern corner of Cell 1. The proposed top elevation for Cell 1 is approximately 846 feet.

2.2.2.2 Cell 2 Development

Cell 2 of the Phase III lateral expansion has an estimated gross operating capacity of 1,550,000 cubic yards and a net waste capacity of 1,170,00 cubic yards. The area for Cell 2 is approximately 14 acres. Cell 2 is divided into six subcells. The life for Cell 2 is approximately 26 months.

Drawing No. C-6, Cell 2 Development, identifies the configuration of Cell 2. The refuse filling of Cell 2 will begin adjacent to Cell 1. The approximate top elevation of Cell 2 along with the tie-in with Cell 1 is 878 feet.

2.2.2.3 Cell 3 Development

Cell 3 of the lateral expansion has an estimated gross operating capacity of 1,850,000 cubic yards and a net waste capacity of 1,365,000 cubic yards. The area for Cell 3 is approximately 12 acres. Cell 3 is divided into three subcells. The life for Cell 3 is approximately 31 months.

Drawing No. C-7, Cell 3 Development, identifies the configuration of Cell 3. This Cell continues the landfill to its final grades. The proposed top elevation for Phase III is approximately 920 feet.

2.2.3 In-Place Ratio of Waste to Soil

The capacities obtained for each Cell Development and the Total Capacity were based on a waste-to-soil ratio of 4 to 1. The assumed refuse density is 1,000 lbs/cy. The assumed filling rate is 22,300 tons per month.

2.2.4 Available Soil Resources and Required Soil Quantities

The available soil resources for the construction of the lateral expansion will come from a combination of on-site excavated soil and off-site resources. The on-site soil source will be screened to obtain as much clay material for construction of the soil liner. Permeability of on-site soils range from 1×10^{-3} cm/sec to 8×10^{-5} cm/sec; therefore, it is assumed that either an off-site source of clay material will be required to complete construction of the 24-inch thick soil component of the Base Liner or bentonite amendment will be required. The

estimated quantity of clay soil (1 x 10^{-7} cm/sec. permeability) that will be required is 170,000 cubic yards. The soil needed to construct structural fills and other appurtenances of the lateral expansion, such as roads, drainage pathways, berms, and operational layers, will be provided from on-site sources and, if required, off-site sources. The requirement for structural fill is estimated at 510,000 cubic yards based on May 1996 existing grades. Approximately 60,000 cubic yards of material will be removed for the construction of Phase III.

The majority of the soils required for operational procedures, such as daily and intermediate cover, are anticipated to come from the on-site borrow area located to the east of Phase III (see Drawing G-1). Approximately 970,000 cubic yards will be required for the life of the expansion.

The construction of the 18-inch thick soil liner component for the final cap will require approximately 120,000 cubic yards of soil. The 18-inch thick vegetative support soil required is approximately 120,000 cubic yards. The 6-inch top soil layer requires approximately 40,000 cubic yards.

2.3 Containment and Environmental Control Systems

The Base Liner and Final Cap System will be constructed in accordance with Section .1624 (b)(8)(9) of the North Carolina Administrative Code, Title 15A, Chapter 13, Subchapter 13B.

2.3.1 Horizontal Separation Requirements

The horizontal separation requirement between the disposal boundary (liner) and the property lines is a minimum of 300 feet, the minimum buffer between private residences and wells and the disposal boundary is 500 feet, and the minimum buffer between any surface water (stream, river, creek) and the disposal boundary is 50 feet. The proposed design satisfies all buffer requirements.

2.3.2 Base Liner System

The Base Liner area for the Phase III expansion is approximately 51 acres and is shown on Drawing No. C-2, Subgrade Plan. The post-settlement bottom elevation of the base liner system will meet the minimum requirement of four feet

above the seasonal high groundwater table and bedrock. As a minimum, the components of the Base Liner from the subgrade will consist of a 24-inch thick material with permeability of no more the 1 x 10^{-7} cm/sec., a 60 mil HDPE geosynthetic liner, a leachate collection system with perforated collection pipes and gravel chimneys to the top of the operational cover, and may be supplemented with a layer consisting of either a geonet with geotextile or 12-inch thick soil with minimum permeability of 1 x 10^{-2} cm/sec. and an operational layer 12 inches thick.

The bottom slope of the cell ranges from 2% to 10%. Based on the boring logs and proposed grading plan, differential settlements were calculated. The critical areas were taken to be the northeast corner and roughly the center of the unit. The calculations are attached and they indicate that differential settlement will be negligible (approximately 0.08%); therefore, post settlement slopes of 2% should be maintained.

2.3.3 Final Cap System

The entire Phase III unit will require a maximum of 51 acres of Final Cap. As a minimum, the components of the Final Cap System from the bottom to the surface will consist of a 12-inch foundation layer (intermediate cover), 18-inch thick low permeability material, FML, 18-inch thick vegetative support layer, and a 6-inch vegetative layer.

The cover will be constructed with drainage swales and down chutes. The landfill is designed with a maximum side slope of 25%, and a minimum of 8%, except along the drainage swales.

2.3.4 Drainage, Erosion and Sediment Control

The Erosion and Sediment Control structures provided will be designed and maintained to manage the run-off generated by the 24-hour, 25-year storm event, and conform to the requirements of the Sedimentation Pollution Control Law (15A, NCAC, 4).

Run-on control structures within the footprint of the landfill include temporary diversion berms and ditches placed across the upgradient areas from the active fill

Cell. The temporary berms and ditches will prevent run-on from either undeveloped areas or previously filled and covered areas from discharging onto the active Cell during a storm event. All storm water collected will be conveyed to either the existing or proposed sediment basins. The storm water collection pipes shown on C-4 are sized for a 25-year/24-hour storm; the calculations are attached.

The regulations specify that the waste shall be covered daily with 6 inches of soil or an alternate cover. The City plans to use either soil or an approved alternate cover on a daily basis. The alternate cover may be used on a daily basis. On weekends and holidays the lift face will be covered with 6 inches of compacted soil.

As part of the Final Cap System, drainage swales will be constructed on top of the vegetative layer to intercept run-off and prevent erosion. The swales will be longitudinally sloped and be approximately 40 vertical feet apart. The swales will carry run-off to strategically located downdrains and/or downchutes. The downchutes are the last carrier of run-off before entering the sediment basins. Perimeter drainage ditches will be constructed to limit the amount of run-off from the site. The sedimentation basins are sized for the greatest area to be drained over the life of the unit. Therefore, at times these basins will be underutilized and may be resized during their life to maintain efficiency. The preliminary sizing calculations are attached.

Plant species meeting the following selection criteria shall be followed as below:

- Vegetation depth of rooting shall not extend to the barrier layer per final cover design;

- Final cover vegetation tolerant to landfill gas and local cover soil conditions;

- Site climate adaptability (temperature, rainfall or drought tolerance, wind effects, exposure, and sunshine);

- Plant species shall be persistent and self-propagating;

- Plant species shall exhibit a high percentage of surface coverage; and

- Plant species shall exhibit low long-term maintenance needs.

2.3.5 Methane Gas Control

Landfill gases are the product of solid waste decomposition under anaerobic conditions. The quantity and types of gas generated depend on the type of waste disposed of. The largest amount of gas generated is generally from waste containing a high percentage of readily degradable organic matter. The rate of generation depends mainly on the moisture content, temperature, and particle size of the waste and the age of the fill. High temperature and moisture content, along with small particle size, tend to result in higher gas production. Gas production from a landfill can last from two to 100 years, but generally peaks after approximately five years, if the moisture content is not limited. Landfill gases predominately consist of methane and carbon dioxide. Initially, the gas is mostly carbon dioxide with methane production beginning later; however, the gas eventually reaches approximately 50% methane by volume.

A gas detection system will be installed between Nealtown Road and the west side of the landfill. This system will monitor for gas migration along the perimeter of the landfill nearest any residential structures. All buildings and enclosed structures on the landfill will be monitored as part of a routine methane monitoring program. In addition, gas extraction wells are proposed to be installed in the final cover. A preliminary layout is shown on Drawing C-8 - Gas Management Plan.

2.4 Leachate Management

2.4.1 Leachate Collection System

The general leachate management system includes the collection, storage, treatment, and disposal of the leachate generated. The collection of leachate will be facilitated by use of perforated HDPE pipe laterals designed (minimum slope of 0.5 percent) to hydraulically convey leachate to a single penetration through the liner and into an HDPE manhole. From there, leachate will be gravity fed through a solid wall HDPE pipe to a lift station located within the leachate

containment area where it will then be pumped into an above ground tank for storage. Clean-out riser pipes will be provided at the edge of the landfill for all of the laterals and header pipes to allow for periodic cleaning. Pretreatment, if required, will be performed on-site to meet the standards for disposal into a sanitary sewer line feeding a Publicly Owned Treatment Works (POTW) facility.

2.4.2 Leachate Generation Rates

The Hydrologic Evaluation of Landfill Performance (HELP) Model Version 3 is typically used to predict the volume of leachate anticipated during three discrete phases, including: active, interim, and closed conditions. Upon modeling the three cases, it was found that the HELP model compared conservatively with the empirical generation rates, which are based upon actual data. Therefore, the HELP model rates have been applied to proposed operational conditions to yield an overall flow rate projection.

In order to determine typical leachate flow rates, the approximate values of 1,920 gallons per acre per day (gpad) for active, 1,200 gpad for interim, and 70 gpad for closed were applied to the proposed operational schedule. For each phase of operation, an operational "snapshot" was developed to depict the typical combination of areas which are being operated, under the three scenarios of active, interim, and closed cases (see attached calculations).

In order to simulate a surge volume, the precipitation event of 5.75 inches for a 24-hour, 25-year storm was applied at the most critical time for each cell. The storm condition was modeled by using the peak daily lateral drainage for one day on the active area, and applying the lateral drainage from the peak month to the filled area. This should be considered as a "worst case" scenario. The model indicates an average flow rate over the life at the landfill to be approximately 27,800 gpd, with a monthly average peak of 72,200 gpd.

2.4.3 Leachate Management Systems

2.4.3.1 Leachate Pipeline Operating Capacity

The selected diameter for the leachate collection laterals and headers (minimum 6 inches) will be sufficient to drain leachate so as not to exceed 1 foot of head

above the Base Liner. The maximum spacing of the laterals is 250 feet. The pipes shown on C-3 are sized and spaced to handle the 25-year, 24-hour storm and not exceed one foot of head on the liner. The chemical properties of the pipes and any materials used in installation will not be adversely affected by the potential corrosiveness of leachate. The physical properties of the pipe will provide adequate structural strength to support the maximum static and dynamic loads and stresses imposed by the overlying materials and any equipment used in construction and operation of the lateral expansion (see attached calculations).

The material surrounding the leachate collection pipes will consist of a coarse aggregate (#57 stone) installed to provide a direct conduit between the pipe and the waste. The aggregate will be chemically compatible with the leachate generated and will be placed to provide adequate support to the pipes.

Calculations for various materials and conditions are included at the end of the application.

2.4.3.2 Leachate Collection Manholes

The leachate collection manholes will be fabricated from high density polyethylene (HDPE) conforming to ASTM standards with material designation PE 3408. All pipe penetrations will be factory fabricated with the manhole. Exterior piping will then be fused to the influent and effluent pipes. Appropriate valves will be installed within the manhole to facilitate maintenance and allow contingency for control of leachate flow. The manhole will be bedded and backfilled as shown on the drawings and as described in the Technical Specifications.

2.4.3.3 Capacity of Storage and Treatment Facilities

The proposed method for storing the extracted leachate from the Phase III expansion will be in the form of an above-ground circular tank. As shown on the drawings, two tanks are proposed for Phase III. Preliminary estimates indicate that a 500,000 gallon tank will be constructed to handle leachate generated from Cells 1 and 2. A 260,000 gallon tank is proposed for the additional leachate expected during the operation of the third cell, if necessary. The requirements for the second tank will be reevaluated once actual generation rate data has been

collected from the first two cells. The tank will be coated to protect against deterioration from the chemical properties of the leachate. The final capacity of the primary tank will be determined after further coordination with the City of Greensboro Utilities Department. A secondary containment system is provided to contain 110 percent of the primary tank volume.

2.4.3.4 Final Disposal Plans and Discharge Limits

The City of Greensboro Utilities Department manages wastewater and intends to internally handle the treatment and disposal of leachate. A sanitary sewer force main is available on landfill property and will be utilized for transporting the leachate to the local POTW. Coordination of the final design is ongoing, and a more detailed layout of the facilities will be provided at a later date, as necessary. (see Section 3.1.7 for additional discussion of leachate management).

SECTION 3.0
ENGINEERING PLAN

3.1 Facility Design

The facility has been designed in general accordance with Section .1620(d) of the Rules. The design includes a composite base-liner system of low permeability clay and synthetic liner.

The proposed horizontal expansion will allow the continued use of existing facilities such as the scalehouse facility, truck scales, paved access road, and the maintenance building. The proposed site development will include excavation of borrow areas, construction of the lined area, perimeter roadway, storm water conveyance, environmental control systems, leachate collection system, and gas management systems.

The facility is currently surrounded on all sides by natural barriers or fencing, to control vehicular access and prevent illegal disposal. All access is limited by gates, and such gates are securable and equipped with locks.

Internal roads will be maintained to be passable in all weather by all vehicles. All operation areas and units will be accessible. Roads will be finished with either gravel or asphalt. Internal roads will be a minimum of 20 feet wide and will not have slopes of more than 8 percent.

3.1.1 General

The Phase III area, with 51 acres of liner, contains airspace for approximately seven years of waste, based on assumptions outlined in Section 2.0 of this document. Because Phase III is a discrete unit and is not expected to be expanded with additional "cells," it is requested that the NC DEHNR Division of Solid Waste Management review the entire Phase III area for permit.

Preparation and development of the facility will require a number of activities including some site clearing, subgrade preparation, soil liner placement, HDPE FML installation, and placement of the leachate collection system.

Construction limits will be set to the minimum area required for site development and landfilling operations. The majority of the area is currently cleared and is within the boundary of the current borrow pit.

Any remaining topsoil will be removed and stockpiled for later use in closure operations. During any site-clearing activity, appropriate erosion and sediment control procedures will be followed to control erosion from disturbed areas. Phase III currently is operating as a borrow pit, with approved erosion control measures in place.

3.1.2 Foundation

The foundation of the landfill is anticipated to consist of the naturally occurring soils and some structural fill material. Based on the geologic exploration of the subsurface (see Design Hydrogeological Report) no areas of gross instabilities are expected. After excavation of the site to the design subgrade, the area will be proofrolled (minimum 20-ton pneumatic tired vehicle) for confirmation and any areas noted to exhibit signs of instability will be excavated and backfilled with structural fill.

As depicted on the drawings, some areas within the borrow pit have been excavated to grades which do not maintain the 4-foot regulatory minimum groundwater separation. These areas will be backfilled with structural fill material to obtain regulatory minimum separation. It is possible, due to the trend of lowered groundwater apparently caused by dewatering of the adjacent ponds, that base grades can be lowered further. This decision will be made, with NC DEHNR approval, as a result of continued groundwater elevation measurements.

Some areas of the proposed landfill also indicate rock outcroppings above proposed base grades or within the 4-foot regulatory minimum separation. As the City continues excavation of the borrow pit, work is ongoing to "rip" the rock down to elevations that maintain the minimum separation. Again, in the areas where rock is to be removed, structural fill will be placed to maintain separation.

3.1.3 Base Liner System

The base liner system is designed to be constructed upon a stable subgrade. A 2-foot layer of low permeability ($<1 \times 10^{-7}$) clay will cover the entire expansion area. The clay will be tightly overlain by a 60 mil HDPE geomembrane. The geomembrane has been checked for failure due to self weight, slipping of operational cover and waste subsidence and failure of the anchor trench and the design is adequate. Calculations are attached.

The leachate collection layer will consist of a geonet on the exterior berm sideslopes. The collection layer will consist of 12 inches of high permeability soil on the bottom of the unit with perforated leachate collection pipes surrounded by stone, and a protective geosynthetic filter fabric. The stone will be constructed like a chimney to the surface of the operational cover, to speed in the removal of leachate from the cells. The LCR system has been designed to allow no more than 1 foot of head on the liner system.

The design as submitted utilizes a drainage media of 12 inches of sand (1×10^{-1} cm/sec) with a 12-inch operational cover of native soil (2×10^{-5} cm/sec).

An operational cover soil provides protection to the LCR system and geomembrane liner from construction and landfill equipment. The operational cover will be a minimum of 24 inches thick on sideslopes and 12 inches elsewhere. Select loads of MSW will form the initial lift to further protect the base liner system. The attached calculations demonstrate stability of the operational cover on sideslopes and the ability of SDR 11 leachate pipes to withstand loading without crushing.

3.1.4 Cap System Design

The final cap system design is placed over the 12 inches of intermediate soil cover. The cap consists of a minimum of 18 inches of low permeability soil ($<1 \times 10^{-5}$ cm/sec) overlain by a geomembrane, a geonet for infiltration collection, 18 inches of cover soil, and 6 inches of top soil. The maximum design slope is 25 percent; vegetation will be established after completion of the cap to control erosion of the soil cover.

3.1.5 Gas Management System

A gas collection system is included as part of the final cap design. At this time, passive wells are depicted. The gas will be directed from the proposed gas wells to the proposed treatment area. The treatment/extraction methods for the Phase II area are currently under discussion. The gas management system for Phase III will likely be an extension of the system currently being developed for Phase II.

3.1.6 Leachate Handling and Storage Facilities

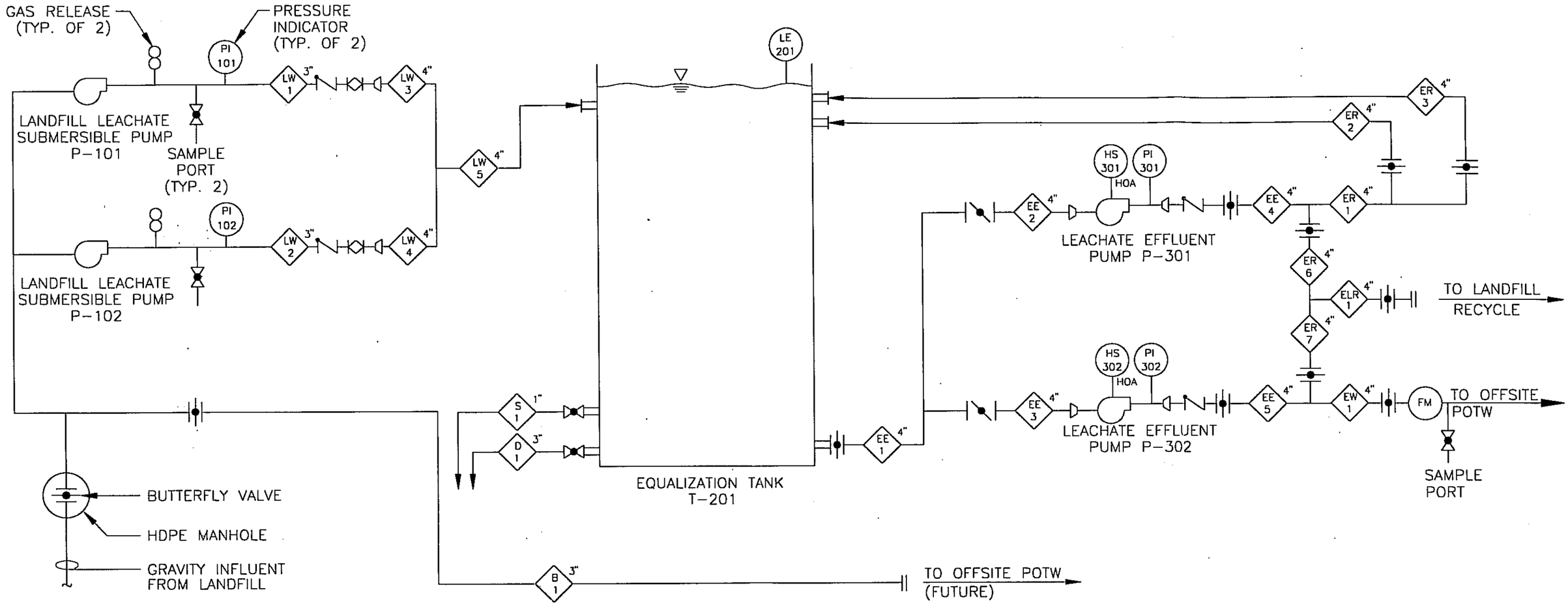
3.1.6.1 General

The most desirable disposal alternative is to pump the leachate from the proposed landfill to the local POTW for initial treatment and discharge.

Due to the variability of leachate generation and water quality, there is no immediate need for extensive wastewater pretreatment facilities. If allowed by the Utilities Department and NC DEHNR, wastewater data will be collected and analyzed for an initial period to determine the need and establish a design basis for future pretreatment facilities. At this time, a storage tank is proposed only for equalization of flow prior to discharge to the City wastewater treatment plant. A process and instrumentation diagram (P&ID) is included for reference.

The proposed leachate equalization tank is located on the eastern side of the landfill expansion area (see Drawing PID-1). The equalization tank and associated pumps will be installed on a concrete foundation. A gravel access road will be extended for access to the facilities by transport trucks, maintenance vehicles, and operations personnel.

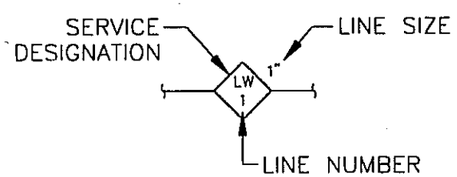
The equalization tank, pumps, and associated above-ground piping are provided with secondary containment. The lined secondary containment area will be constructed around the tanks and will be sized for containment of 110 percent of the largest tank volume. The type of secondary containment is currently expected to consist of concrete floor with steel or concrete walls. The exact type of containment will be determined during the bidding process. This containment area will be piped for drainage of storm water into the adjacent storm water



TYPICAL INSTRUMENTATION ABBREVIATION

LE	LEVEL ELEMENT
PI	PRESSURE INDICATOR
HS	HAND SWITCH
HOA	HAND-OFF-AUTO SELECTOR SWITCH

TYPICAL PIPING CALL-OUT



VALVE LEGEND

	BALL VALVE
	BUTTERFLY VALVE
	CHECK VALVE
	PLUG VALVE
||	CAPPED/FLANGED STUB-OUT

PIPING LINE DESIGNATIONS

LW	LEACHATE WASTEWATER	EE	EQUALIZED EFFLUENT
D	DRAIN	EW	EQUALIZED WASTEWATER
R	RECIRCULATION	ER	EQUALIZED RECIRCULATION
S	SAMPLE LINE	ELR	EQUALIZED LANDFILL RECYCLE

HDR

HDR Engineering, Inc.

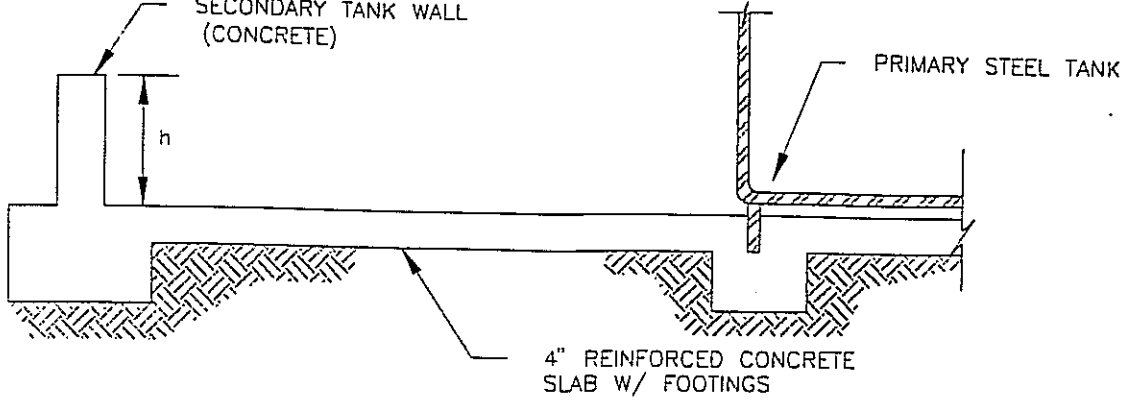
CITY OF GREENSBORO
WHITE STREET SANITARY LANDFILL
PHASE III EXPANSION

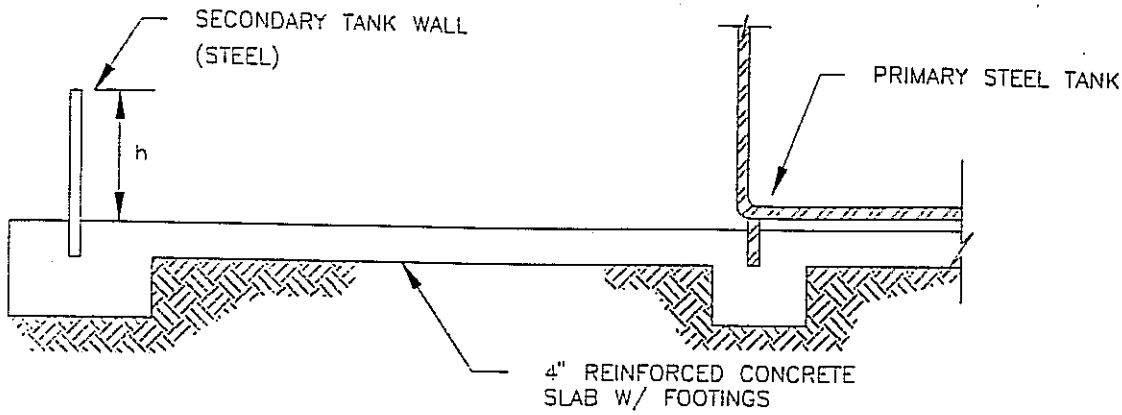
LEACHATE TREATMENT SYSTEM PROCESS AND INSTRUMENTATION DIAGRAM

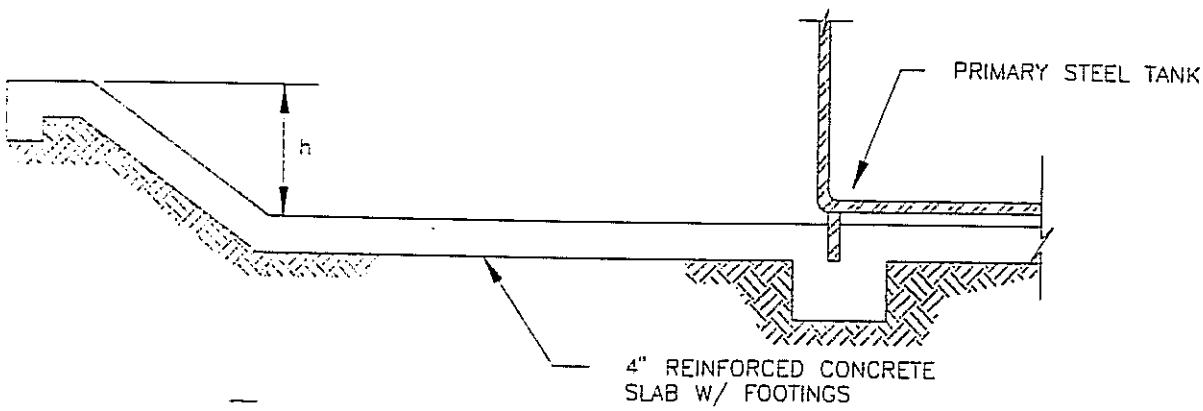
Date 2/15/96

Figure PID-1

P:\GBOF —1A.DWG







NOTES:

1. "h" IS EXPECTED TO BE BETWEEN 3' AND 6'
   FINAL HEIGHT WILL DEPEND ON AREA ENCLOSED.

ALTERNATE
SECONDARY LEACHATE CONTAINMENT CROSS SECTIONS

NO SCALE

basin. However, the pipe will have a manual valve that is to remain closed during normal operations. This arrangement will ensure that any tank failures or accidental spills are identified by the operations staff and properly handled.

3.1.6.2 Final Disposal Plans and Discharge Limits

The leachate collection system includes two submersible pumps located inside an HDPE manhole. A series of float switches mounted inside the manhole will signal the pumps to operate and transfer leachate to the on-site equalization tank. The float switches can be set to turn the pump on and off as well as to signal a high level alarm. Similarly, the leachate storage tank will be equipped with a high level float switch to prevent the pump from over topping the tank. An electronic flow meter will be installed to record the amount of leachate discharged.

In the event of a power failure, a portable generator may be utilized to pump leachate. Under normal operations, the liquid level is maintained at less than 1 foot above the membrane liner.

The HDPE manhole will allow easy removal for operation and maintenance. The two pumps will transfer leachate via a combination of PVC and HDPE piping (force mains) to the equalization tank. All leachate piping systems are equipped for periodic flushing to remove any settled debris or other pipe restrictions.

3.1.6.3 Leachate Equalization

Depending on the time of year, age of landfill, operation of the landfill, and range of storm events, leachate generation will vary. The purpose of equalization of the process wastewater flow is twofold. A large volume is necessary to equalize water quality variation which may result from various landfill operations. Secondly, equalization is required to control hydraulic fluctuations. By dampening both the hydraulic and water quality fluctuations, a more steady and consistent flow can be transferred for treatment.

3.1.6.4 Contingency Measures

The leachate collection and treatment system is driven primarily by electric power. As a result, any major power failure of the supply to the facility would

eliminate treatment and disposal capabilities. In the event of such conditions, the site would be forced to store leachate within the lined landfill. However, excess storage capacity is available within the landfill. Under certain conditions a liquid level greater than 1 foot may be imposed on the membrane liner for periods up to one week.

For extended periods of downtime, the pumps may run from power provided by portable generators. In addition, tanker trucks may be utilized to remove leachate from the tank for eventual disposal at the City wastewater treatment plant.

3.2 Construction Practices

A test pad will be constructed of the soils proposed for use as the clay liner to determine the construction methods necessary to achieve the design criteria as outlined in .1624.(8)(B). The leachate collection system will be constructed in general accordance with rule .1624(10)(B). The geomembrane liner will be constructed in general accordance with rule .1624(9)(B).

3.3 Special Engineering Features

The proposed landfill design was evaluated for seismic and static slope stability. The EPA guidelines for minimum factors of safety against slope failure are 1.5 statically and 1.0 dynamically. These minimum factors of safety are met by this design assuming a conservative cohesion value for waste of 300 pounds per square foot. The complete analysis is included in the calculation section.

3.4 Design Hydrogeologic Report

A copy of the complete report is contained within this application.

SECTION 4.0
CONSTRUCTION QUALITY ASSURANCE PLAN

4.1 Introduction

This Construction Quality Assurance (CQA Plan) has been prepared to provide Owner, Engineer, and CQA consultant the means to govern the construction quality and to satisfy landfill certification requirements under current North Carolina Solid Waste Management regulations. This plan has been developed in general accordance with Rule .1621.

More specifically, this CQA plan addresses the soils and geosynthetic components of the liner and leachate control/removal (LCR) systems. The liner system as referenced herein generally consists of a soil subgrade and a composite liner (consisting of a compacted soil liner and overlying HDPE geomembrane liner). The LCR system consists of a granular drainage material with perforated collection piping, manholes, and fittings. The complete construction quality assurance plan is contained in this application. This section is meant as a brief overview of that plan.

4.2 Responsibilities and Authorities

The CQA plan contains definition of construction quality assurance along with the description of the various parties and their roles in providing a quality product. The parties associated with construction quality assurance and quality control include the owner, project manager, engineer, contractor, geosynthetics manufacturer, geosynthetics installer, CQA consultant, geosynthetics CQA laboratory, Soils CQA laboratory, CQC consultant, geosynthetics CQC laboratory, and Soils CQC laboratory. A diagram illustrating the lines of communication between the various parties is illustrated in the attached plan. A resolution meeting will be held prior to mobilization by the contractor to resolve any anticipated problems with construction, as a result of the contractor's review of the construction documents. A preconstruction meeting will be conducted prior to beginning placement of the liner system. These meetings will review the construction management organization, respective duties during construction, and periodic reporting requirements of tests and construction activities.

4.3 Inspection Activities

A description of all field observations, test equipment, and calibration procedures for field testing equipment that will be used is provided in the CQA Plan included in this application. These activities will ensure that the construction and installation meets or exceeds all design criteria established for the project. Inspection activities will include subgrade preparation, soil liner construction, the geomembrane liner, the leachate collection and removal system, geotextiles, high density polyethylene pipings and fittings, and any geonets and geogrids. A description of all sampling protocols and sample sizes, methods for determining sample locations, and frequency of sampling is presented in the CQA plan.

4.4 Documentation

Documentation will include all reports and tests results prepared by the contractor and the CQC consultant as well as summaries by the CQA consultant progress reports, photographic records, and design or technical specification changes made during construction. The documentation will be safely stored on the site and become property of the owner upon completion of the project.

SECTION 5.0
OPERATION PLAN

5.1 Introduction

The purpose of this section is to identify protocols for the overall operation and maintenance of the White Street Sanitary Landfill, which is owned and operated by the City of Greensboro. The landfill, which is located at the east end of White Street and is currently permitted to accept municipal solid waste generated within the City of Greensboro and Guilford County. This Plan has been prepared in accordance with Rule .1625 and provides details of the procedures and policies which currently are, or shall be, implemented throughout the life of the City of Greensboro's White Street Sanitary Landfill. Detailed drawings for each phase of the landfill's development are presented in the Operational Drawings for this Operational Plan. These Drawings illustrate the existing conditions of the landfill (including known limits of existing and previous disposal areas; and buffer zones), the fill phasing (including the progression of operation including daily operation, transition contours and final contours), and proposed final contours and erosion control plans (including storm water controls; and, stockpile and borrow operations).

5.2 Standard Operating Procedures

5.2.1 Hours and Days of Operation

The landfill is at present, and is anticipated to be, open for operation between the hours of 7:00 AM and 4:50 PM, Monday through Friday, and from 7:00 AM and 1:00 PM on Saturday. The landfill is normally closed on Sundays except where prior permission has been given to receive waste for special instances such as a natural disaster. The observed holidays are New Year's Day, Martin Luther King Jr. Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day.

Special notices are posted at the scalehouse advising users of observed holidays. Such notices are posted at least one week in advance of the holiday.

5.2.2 Traffic Routing

An entrance sign is posted stating the facility name, permit number, and operating hours. Additional signs are posted for allowable speed limit and directional signs indicating the location of the disposal area.

All trucks entering the landfill to dispose of solid waste are weighed at one of two (2) 70' x 10' inbound scales at the scalehouse. Regular users may not be weighed upon leaving if vehicle tare weights are known.

Automobiles and low-sided pickup trucks are required to weigh in. However, the Scale Attendant(s) controls access to the landfill to prevent abuse and misuse. A designated area at the fill face is set aside for these small vehicles to dispose of solid waste. This area is separated from the area being used by the City and private haulers.

Internal roads are hard surface or gravel and are maintained to be passable in all weather by all vehicles so that operation areas and units are accessible.

The total length of roadway from the entrance to the scales and from the scales to the disposal area will be approximately 1,400 feet. This provides sufficient queuing distance for trucks during the peak traffic periods.

Perimeter roads and operational access roads will be built to allow for 2-way truck traffic. The operational access road on the fill has been developed with branch roads extending from the exterior to the interior. A level area for truck turning will be maintained ahead of the active disposal area. The trucks come in via the access road, dump their load, turn around, and exit via the access road.

The approach to the working face is maintained such that two or more vehicles may safely unload side-by-side. A vehicle turn-around area large enough to enable vehicles to arrive and turn around safely with reasonable speed is provided adjacent to the unloading area. The vehicles back to a vacant area near the working face to unload. Upon completion of the unloading operation, the transportation vehicles immediately leave the working face area. Personnel direct traffic as necessary to expedite safe movement of vehicles.

5.2.3 Litter Control

Litter control is a prime requisite in the proper operation of the landfill. In order to control litter and windblown debris, the working face is kept as small as possible and waste is compacted soon after it is unloaded. Cover material is applied daily. If required, portable litter fences will be utilized downwind of and in close proximity to the working areas to catch blowing litter. The area around the work face and the property in general is routinely checked and the litter removed on a regular basis.

5.2.4 Odor, Dust, and Noise Control

Odors which emanate from solid waste as it is placed and compacted are generally limited to within a short distance of the working face. The covering of waste on a daily basis prevents odors from becoming a nuisance.

The access road from the scalehouse to the landfill unit is paved; all other service roads on the operating landfill are graded as necessary to maintain smooth, well-drained surfaces. During extended dry periods, operating roads may be sprayed with water to reduce dust problems. Regular maintenance of soil stockpiles, including frequent wetting or temporary seeding, serves to limit the generation of wind blown dust. Similarly, frequent wetting of on-site roads prevents truck traffic from creating dust.

Noise resulting from landfill equipment is limited to the period of time during operating hours. To reduce the nuisance of noise to neighbors or the administrative function of the landfill, a buffer of trees and other vegetation is maintained between the operating areas and other areas not designated for landfill operations. All on-site equipment is equipped with mufflers or similar noise-dampening devices. Equipment operators, drivers, and other operating personnel will be trained in the use of equipment in an effort to minimize noise generation. These efforts help to ensure that noise does not become a nuisance problem to neighbors or to the administrative function of the landfill.

5.2.5 Inclement Weather Operations

During periods of heavy rainfall, the work area is kept as close to the landfill service roads as practical.

5.2.6 Personnel Structure

Responsibility for overall facility management and operation rests with the Landfill Manager. This individual is designated as the contact person for matters related to regulatory compliance, and is responsible for providing adequate personnel and equipment in order to operate the facility in accordance with the approved permit documents and the North Carolina Solid Waste Management Rules and Solid Waste Management Law.

Landfill supervisory staff includes the Landfill Manager, the Landfill Supervisor, and the Scalehouse Supervisor. In addition to the supervisory staff, the City has twelve other permanent staff available for operations at the landfill. These staff positions include a two person environmental staff that oversees waste screenings, load inspections, groundwater wells maintenance, and methane gas monitoring.

The Scale Attendant(s), stationed at the scalehouse at the site entrance, is responsible for maintaining complete and accurate records of vehicles and visitors entering and leaving the facility. The Scale Attendant(s) also visually inspects incoming vehicles to the extent that the loads are covered properly and determines if the load is acceptable.

An equipment operator doubles as a truck spotter directs incoming vehicles to the proper location to unload refuse at the working face. The primary function of the spotter is to prevent unloading in areas that are not designated for disposal and to visually inspect all loads as they are dumped to assure compliance with posted operating rules. A traffic controller is located at the working face to direct vehicles to the location where the waste is to be unloaded.

Equipment operators are responsible for the safe operation of site equipment. As the personnel most closely involved with the actual landfill operation, these employees are responsible for identifying any potentially dangerous conditions, monitoring waste for unauthorized or hazardous materials, as well as careless or improper actions on the part of other persons while on the premises, and

reporting such observations immediately to the Landfill Supervisor and the environmental specialist. Other services such as sediment basin maintenance, construction, site clean-up, etc. may be contracted to outside firms on a temporary basis.

5.2.7 Personnel Training

The Landfill Manager and the Landfill Supervisor are both Certified Managers of Landfill Operations (MOLO) by the Solid Waste Association of North America (SWANA) as required by GS 130A-309.25. In addition to trained supervisory staff, each landfill employee goes through a 10-hour training course (led by supervisory staff) and is certified by SWANA as Landfill Operations personnel. These staff are then recertified on an annual basis. As part of this training, personnel learn to reorganize loads which may contain regulated hazardous waste or wastes containing PCB's. Landfill personnel are all trained in safety procedures for fire fighting, first aid, CPR, and the handling of hazardous materials.

5.2.8 Management Authority

The management authority, or chain of command for decisions regarding landfill operation is depicted in Figure 5-1.

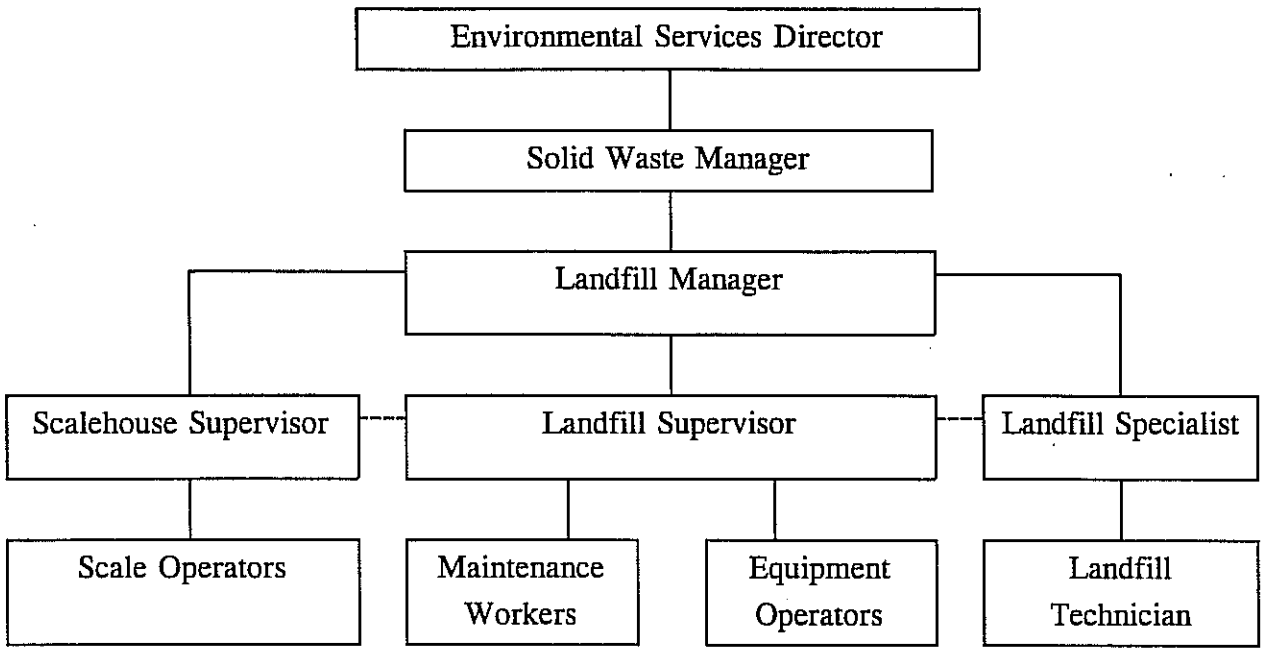
5.2.9 Equipment Requirements

Equipment requirements may vary in accordance with the method or scope of landfill operations at any given time. Additional or different types of equipment may be provided as necessary to enhance operational efficiency. The types and sizes of equipment currently in use at the White Street Sanitary Landfill are presented in Table 5-1.

5.3 Waste Screening Programs

In order to assure that prohibited wastes are not entering the landfill facility, screening programs have been implemented at the White Street Sanitary Landfill. Waste received at both the scalehouse entrance and waste taken to the working face is inspected by trained personnel. These individuals have been trained to spot indications of suspicious wastes, including: hazardous placarding or markings; liquids; powders or dusts; sludges;

FIGURE 5-1
CITY OF GREENSBORO
WHITE STREET SANITARY LANDFILL ORGANIZATIONAL CHART



bright or unusual colors; drums or commercial size containers; and "Chemical" odors. Screening programs for visual and olfactory characteristics of prohibited wastes are an ongoing part of the landfill operation. These programs are implemented in accordance with Rule .1626 Part (1)(f).

5.3.1 Waste Receiving and Inspection

All vehicles must stop at the scalehouse located at the entrance of the landfill facility and visitors are required to sign-in. All refuse transportation vehicles are weighed and the content of the load assessed. Any materials which pose health hazards, cause fire, or which could impact negatively on the environment are deemed unacceptable. The Scale Attendant(s) requests from the driver of the vehicle entering the landfill a description of the waste it is carrying to ensure that unacceptable waste is not allowed into the landfill. The Attendant(s) then visually checks the vehicle as it crosses the scale. Signs are conspicuously posted informing users of the acceptable and unacceptable types of waste.

TABLE 5-1
CITY OF GREENSBORO, WHITE STREET SANITARY LANDFILL
CURRENT EQUIPMENT INVENTORY

Description	Make/Model	No.	Comment
Landfill Compactor	826C Cat	3	
Bulldozer	D8N Cat	2	
Grader	140G Cat	1	
Loader	WA250-1 Komatsu 1994 FR20B Fiat Allis	1 1	
Earthmover	627E Cat	2	
Excavator	K916LC-2 Kobelco	1	
Tractor	White	1	w/Lowboy Trailer
Dump Truck	D400D Cat	3	Off Road
Other Trucks	F250D HD Ford 1994 C70 Chevrolet 2500 Chevrolet 1989	1 1 1	 Fuel Truck Maint.
Other (specify):	900 Ford Cheyenne 1993 Chevrolet Ford 8000 Kubota L275 John Deere 2355 Toro Kawasaki Mule	1 1 1 1 1 1 1	Water Truck Maint. Maint. Utility Tractor w/Mower Lawn Mower Utility vehicle

Each day trucks hauling commercial and industrial loads of waste are selected for screening at random on an appropriate percentage basis. Selected vehicles are directed to a lined area separate from the working face where the vehicle will be unloaded. Waste is carefully spread using suitable equipment. An attendant trained to identify wastes that are unacceptable at the landfill inspects the waste discharged at the screening site.

If waste is detected which is suspected to be unauthorized liquid waste (liquids in containers or non-bulk/non-containerized liquids other than household wastes), the attendant will perform a paint filter test on a sample of the suspect waste. The paint filter test will be performed as follows:

- a 100 milligram sample of waste will be placed in a conical, 400 micron paint filter;
- if liquid passes through the paint filter in five minutes, the conclusion that the waste contains free liquid will be made.

If unacceptable waste is found, including wastes generated from outside of Guilford County, the load will be isolated and secured by berming off the area. The Landfill Manager will then notify the following official of the North Carolina Department of Environment, Health, and Natural Resources, Division of Solid Waste Management within 24 hours of attempted disposal of any waste the landfill is not permitted to receive in order to determine the proper course of action (it should be noted that the hauler is responsible for removing unacceptable waste from the landfill property):

Mr. Hugh Jernigan
Waste Management Specialist
585 Waughtown Street
Winston-Salem, NC 27107
(910) 771-4600

The following records are kept on-site to document all inspections:

- The date and times wastes were received for inspection
- Source and type of wastes
- Vehicle and driver identification
- All observations made by the inspector
- Final disposition of waste after inspection

5.3.2 Prohibited Waste Types

The following wastes are prohibited from disposal within a municipal solid waste landfill (MSWLF) unit:

- Whole Scrap Tires
- Used Oil
- White Goods

- Lead Acid Batteries
- Yard Trash
- Asbestos Waste

In addition, operating criteria prohibit other materials from disposal at the MSWLF unit. These criteria address the following types of waste:

- Hazardous waste as defined within 15A NCAC 13A, including hazardous waste from conditionally exempt small quantity generators.

- Polychlorinated biphenyls (PCB) wastes as defined in 40 CFR 761.

- Bulk or non-containerized liquid wastes unless the waste is household waste other than septic waste and waste oil; or the waste is leachate or gas condensate derived from the MSWLF unit, whether it is a new or existing MSWLF unit or lateral expansion, is designed with a composite liner and leachate collection system.

- Containers holding liquid wastes unless the container is a small container similar in size to that normally found in household waste; the container is designed to hold liquids for use other than storage; or the waste is household waste.

- Wastewater treatment sludges unless they are used as a soil conditioner and incorporated or applied to the vegetative growth layer (at a depth no greater than six inches).

5.3.3 Hazardous Waste Contingency Plan

In the event that identifiable hazardous waste or waste of questionable character is discovered at the landfill, the following procedure shall be instituted immediately:

- The employee that discovers the waste shall see that all personnel, customers, and visitors are evacuated a safe distance upwind from the waste.

- Notify the Landfill Manger, Supervisor, and Landfill Specialist.

- Keep all personnel at a safe distance and maintain security until the Manager, Supervisor, or Specialist arrives and assumes command.

- In the event the waste presents a hazard to human health or the environment, the City of Greensboro Fire Department will be notified and a response by the Hazardous Materials Team requested.

- Notify the Manager of the City Solid Waste Management Division and the Director of the Department of Environmental Services.

- As soon as adequately trained personnel with the proper protective equipment are available, appropriate measures shall be taken to contain the waste and prevent additional contamination.

- Notify the NC DEHNR Division of Solid Waste Management.

If the vehicle disposing of such waste is known, attempts shall be made to prevent that vehicle from leaving the site or, if the vehicle has left the site, notice will be served on the owner of the vehicle that waste for which it has responsibility has been improperly disposed of at the landfill.

Any unauthorized wastes will be removed from the landfill and, if possible, back onto the transporter's vehicle. If the waste cannot be returned to the transporter's vehicle, it will be isolated from the remaining waste and contained to the extent possible. If needed, the waste will be covered with either on-site soils or other tarping material until such time when an appropriate method can be implemented to properly handle the waste. The cost of the removal and disposing of the waste shall be charged to the owner of the vehicle involved. Any vehicle owner or operator who knowingly dumps unacceptable waste in the landfill may be barred from using the landfill and may face prosecution.

Should an incident where prohibited waste is found at the landfill occur, the event shall be documented as follows:

- Date and time of material detection
- Hauler name (company and driver)
- Material(s) detected
- Material generator(s) if able to identify
- Action(s) taken to manage or return material(s)
- Efforts taken if extreme toxicity or hazard was discovered
- Landfill employee in responsible charge

5.4 Waste Disposal

Solid waste transportation vehicles arrive at the working face at random intervals. There may be a number of vehicles unloading waste at the same time, while other vehicles are waiting. In order to maintain control over the off loading of waste, a certain number of vehicles are allowed on the working face at a time. The actual number is determined by the truck spotter. This procedure is used in order to minimize the potential of off loading non-acceptable waste and to control disposal activity. Operations at the working face are conducted in a manner which will encourage the efficient movement of transportation vehicles to and from the working face, and to expedite the unloading of solid waste.

Solid waste unloading at the landfill is controlled to prevent disposal in locations other than those specified by site management. Such control is also used to confine the working face to a minimum width, yet allow safe and efficient operations. The width of the working face is maintained as small as practical in order to maintain the appearance of the site, control windblown waste, and minimize the amount of cover soil required each day. Normally, only one working face is active on any given day, with all deposited waste in other areas covered by either daily, intermediate cover or final cover, as appropriate.

Other services such as sediment basin maintenance, construction, site clean-up, etc. may be contracted to outside firms on a temporary basis.

The sequence of fill will proceed uphill from the low end, subcell by subcell. Using multiple lifts allows filling to occur uniformly across the subcells, eliminates depressed areas and facilitates movement of storm water off site. Less extreme elevation differences occur during construction when using multiple lifts. Waste disposal activities are expected to start in the northeastern corner and progressing south and west across the cells.

All putrescible solid waste delivered to the working face, such as spoiled foods, animal carcasses, abattoir waste, hatchery waste, and other animal waste, is covered immediately. Asbestos waste is not accepted at the landfill.

Use of portable signs with directional arrows and portable traffic barricades facilitates the unloading of wastes to the designated disposal locations. These signs and barricades are placed along the access route to the working face of the landfill or other designated disposal areas which may be established.

5.5 Spreading and Compacting

The procedures for the placement of waste in the landfill include the unloading of trucks, checking of waste for fire, the even spreading of waste, and compaction using the landfill compactor equipment in layers not to exceed eighteen inches in depth. These layers are applied to construct a lift of approximately ten (10) feet in depth after compaction. The level of compactive effort should be sufficient to produce a waste cohesion volume of 300 pounds per square foot. Cover material will be placed over the compacted waste at the end of each day. The size of the working face where unloading, spreading, and compacting takes place will be limited to allow for the most efficient use of cover material.

5.6 Cover Requirements

A significant volume of soil is required to provide for the cover requirements of the White Street Sanitary Landfill. In order to provide for these requirements, on-site borrow areas are excavated in stages to keep pace with the demand for soil. The borrow areas are located south of the entrance road. During normal operations material is excavated, loaded, hauled and then placed over the waste. The development of large stockpiles which result in double handling of materials is avoided. However, stockpiling of material may be necessary prior to the winter when excavating materials is more

difficult due to colder, wetter weather. Off-site soil or alternative cover may be used to reduce the on-site requirements for soil cover.

5.6.1 Daily Cover

In accordance with Rule .1626 (2)(a) disposed solid waste is covered with six inches of earthen material at the end of each operating day, or at more frequent intervals if necessary, to control disease vectors, fires, odors, blowing litter, and scavenging.

The City plans to use either soil or an approved alternative cover on a daily basis. This alternate cover may be used on a daily. On weekends and holidays the lift face will be covered with six inches of compacted soil.

The White Street Sanitary Landfill has an adequate quantity of acceptable earth cover for routine operations.

5.6.2 Intermediate Cover

Intermediate cover consisting of a total thickness of twelve inches is applied to all areas which will not have wastes placed on them for 12 months or more, but where final termination of disposal operation has not occurred. The areas which have received intermediate cover are graded to prevent ponding and temporary grass cover is planted. Any erosion or other damage which has occurred to the intermediate cover is repaired on a routine basis. Litter fences are installed to reduce blowing litter.

5.7 Disease Vector Control

The need for extensive disease vector control (control of rodents, flies, mosquitoes, or other animals, including insects, capable of transmitting disease to humans) is minimized through proper site operation, including on-going compaction and application of daily and final cover. If vector problems develop that require control beyond the measures indicated above, appropriate measures will be taken.

5.8 Explosive Gases Control

Landfill gases are the product of solid waste decomposition under anaerobic conditions. The quantity and types of gas generated depend on the type of waste disposed of. The largest amount of gas generated is generally from waste containing a high percentage of readily degradable organic matter. The rate of generation depends mainly on the moisture content, temperature, and particle size of the waste and the age of the fill. High temperature and moisture content, along with small particle size, tend to result in higher gas production. Gas production from a landfill can last from two to 100 years, but generally peaks after approximately five years, if the moisture content is not limited. Landfill gases predominately consist of methane and carbon dioxide. Initially, the gas is mostly carbon dioxide with methane production beginning later; however, the gas eventually reaches approximately 50% methane by volume.

A gas monitoring system will be constructed along the perimeter of the landfill. This system will be monitored with a mobile combustible gas indicator (CGI) to check for gas migration along the perimeter of the landfill nearest any residential structures. All buildings and enclosed structures on the landfill are monitored as part of a routine methane monitoring program. Routine monitoring for gas migration is performed in accordance with Rule .1626 Part (4)(b) on a quarterly basis to ensure that the following compliance levels for methane concentration are not exceeded: 1) the concentration of methane gas generated by the facility does not exceed 25% of the lower explosive limit (LEL) for methane in facility structures (1.25% methane); and 2) the concentration of methane gas migrating from the landfill does not exceed the LEL for methane at the facility property boundary (5% methane).

If concentrations are measured at greater than 25 percent of the LEL for methane in facility structures then the City will immediately take all necessary steps to ensure protection of human health and shall notify the Division of Solid Waste Management. Within seven days of detection, the methane gas levels detected and a description of the steps taken to protect human health shall be placed in the operating record. Within sixty days of detection, a remediation plan describing the nature and extent of the problem and the proposed remedy for methane gas releases shall be placed in the operating record, the remediation plan shall be implemented, and the Division of Solid Waste Management shall be notified that the remediation plan has been implemented.

5.9 Air Criteria

In accordance with the State Implementation Plan developed under the Clean Air Act Section 110, open burning is prohibited at the site, unless approved by the Division for the infrequent burning of land clearing debris generated on site or debris from emergency clean-up operations. In order to control accidental fires from occurring at the site, the following preventative measures have been taken:

- The Scale Attendant(s) and equipment operators screen incoming waste loads for signs of hot loads, such as smoke, steam or heat being released from the waste, in order to prevent such loads from being off-loaded in the active area of the landfill.

- Smoking is confined to designated areas only, away form active areas of the landfill, fuel stations, methane collection and treatment equipment and other fire-sensitive areas.

- Motorized equipment is not parked near fuel stations longer than necessary for refueling.

- Fuel spills are contained by berming and cleaned up immediately using some type of absorbent material.

- Landfill equipment does not remain in the active area of the site overnight.

- Dead trees, brush, or vegetation adjacent to the landfill are removed immediately, and grass and weeds mowed so that brush fires cannot spread to the landfill. A mower/shredder is available to control grass and brush.

Fire fighting equipment is available on-site to control fires should they occur. In addition, all equipment is equipped with automatic fire extinguisher systems and all landfill personnel have been certified in CPR as of July 1, 1995. In the event that additional fire protection be needed, the City of Greensboro Fire Department will be contacted immediately to provide fire-fighting services. The Division of Solid Waste Management will be notified verbally within 24 hours of any fire occurrence at the landfill, and written notification shall be submitted to the Division within 15 days of the fire incident.

5.10 Access and Safety Requirements

Entry to the site is limited to landfill personnel, approved waste haulers and properly identified persons whose entry is authorized by the site management. The City reserves the right to restrict access to the site. Visitors may be allowed near the active area only when accompanied by a site representative.

An entrance sign is posted stating the facility name, permit number and operating hours. Additional signage regulates traffic flow, provides information on dumping procedures, the type of waste the facility is permitted to receive as well as those wastes banned from disposal at the facility, and indicates the location of the disposal area.

Facility roads are maintained to be passable to ensure that all operation areas and units are accessible in all weather conditions. Dust control measures, including wetting or temporary seeding of soil stockpiles and wetting of on-site roads, are implemented when necessary.

All facilities are surrounded on all sides by natural barriers, fencing, or an equivalent means of controlling vehicular access and preventing illegal disposal. All access is limited by gates, and such gates are securable and equipped with locks.

Scavenging is not permitted at the landfill. If the volume of salvageable goods is sufficient, those items are set aside for salvage disposal by the City of Greensboro; however, under no circumstances are goods to be salvaged from the working face. Items stockpiled for possible salvage are maintained in a neat and orderly fashion.

Barrels and drums are not be disposed of unless they are empty and perforated sufficiently to ensure that no liquid or hazardous waste is contained therein, except fiber drums containing asbestos.

5.11 Sedimentation and Erosion Control

The landfill will be constructed with maximum 4:1 side slopes and minimum 12.5:1 top slopes to promote runoff and prevent ponding over or in the waste. Perimeter drainage channels at the toe of the slope will provide runoff, erosion, and sediment control. The drainage channel allows for the movement of surface water from landfilling activities and provides a settling zone for sediments carried from the site. The channel is constructed to allow drainage via sediment basins through natural outfalls to North Buffalo Creek.

In addition to the drainage channel, sediment basins, silt fences, slope drains, and sediment traps, temporary and permanent seeding will be used to mitigate sedimentation and erosion control problems. All measures will be constructed or installed in accordance with standards specified in the North Carolina Erosion and Sediment Control Planning and Design Manual.

Sediment basins will also prevent the discharge of pollutants that violate requirements of the Clean Water Act, including, but not limited to, NPDES requirements, into the waters and wetlands of the United States.

The landfill will have a comprehensive surface and groundwater monitoring program to provide early detection of any leachate migration problems. In the event any constituents are detected above allowable limits, measures will be taken to begin assessing the extent of contamination and, if necessary, corrective actions will be taken to prevent the pollution of waters and wetlands of the United States, that violate any requirements of an area-wide or state-wide water quality management plan that has been approved under Section 208 or 319 of the Clean Water Act, as amended.

5.12 Drainage Control and Water Protection Requirements

The landfill will be constructed with 4:1 side slopes and 12.5:1 top slopes to promote runoff and prevent ponding over or in the waste. Perimeter drainage channels at the toe of the slope provide runoff, erosion, and sediment control. Sediment basins will also prevent the discharge of pollutants into the waters of the United States, including wetlands, that violates any requirements of the Clean Water Act, including, but not limited to, NPDES requirements.

The landfill has a comprehensive surface and groundwater monitoring program to provide early detection of any leachate migration problems (see Section 11.0). In the event any constituents are detected above allowable limits, measures will be taken to begin assessing the extent of contamination and, if necessary, corrective actions will be taken to prevent the pollution of waters of the United States, including wetlands, that violate any requirements of an area-wide or state-wide water quality management plan that has been approved under Section 208 or 319 of the Clean Water Act, as amended.

5.13 Leachate Management

The leachate collection system will be inspected annually to determine if clean-out of the lines is required. Any unusual fluctuation in leachate quantity or incident affecting the collection system will also trigger a complete inspection of the system. Records will be kept indicating any maintenance performed on the system and all associated test results. Leachate samples will be obtained semi-annually from the pump station for quality analysis. These results will be forwarded to the treatment plant operator and maintained on-site for regulatory review. Provisions will be made for hauling leachate by truck should that become necessary. The tank's final sizing will be determined by the allowable discharge rate into a POTW pipeline and a minimum of one week emergency capacity. The emergency capacity is to account for repairs to system pumps of discharge lines. The plan will be revised after any unexpected condition to reflect the appropriate action in the event of a recurrence.

5.14 Record Keeping

The City of Greensboro maintains detailed records of all activities relating to the landfill. These records are either kept on site or at the office of the City's Public Works Department and include: types and quantities of waste received; source of waste received; revenue generated from waste received; applications for industrial waste disposal and related analyses; well water usage; results from surface and groundwater monitoring, landfill gas monitoring; leachate quantity and quality results; correspondence from regulatory agencies; accident reports; and reports of site and random load inspections. Table 5-2 provides a summary of the records kept, their frequency of completion, and the locations where the records are maintained.

TABLE 5-2
CITY OF GREENSBORO
WHITE STREET SANITARY LANDFILL RECORD KEEPING

Type of Record	Frequency of Completion	Location Maintained
Waste quantities received	Daily	Landfill
Source of waste received	Daily	Landfill
Revenue from waste received	Daily	Landfill
Industrial waste applications and analyses	Before initial waste disposal and annually thereafter	Landfill
Well water usage	Daily	Landfill
Surface and groundwater monitoring data	Semi-annually	Landfill
Related correspondence	As received	Landfill
Accident reports	After each occurrence	Landfill
Site inspections	Daily, quarterly, annually	Landfill
Results of random waste load inspections	After each inspection	Landfill
Gas monitoring results	Quarterly	Landfill
Leachate quality	Semi-annually	Landfill
Leachate quantity	Monthly	Landfill
Closure/ Post Closure estimate	Annually	Landfill

SECTION 6.0
CLOSURE PLAN

6.1 Cap System Background

In compliance with the Solid Waste Management Rules, the landfill will place a final cap system over all waste placed in the Phase III expansion. The cap system will be designed and constructed in accordance with Rule .1624 (b) (8), (9), and (15), to minimize infiltration and erosion. It is estimated that the total landfill volume at completion will be 4,960,000 cubic yards. The maximum area requiring a cap at any one time is approximately 51 acres.

6.2 Cap System Design

The cap system designed will be checked prior to closure and revised and updated as appropriate. Compacted clay liners will be incorporated in the cap system design to provide protection throughout the 30-year post-closure period and beyond. The system will consist of, from bottom up; an 18-inch compacted clay liner (1×10^{-5} cm/sec); a geomembrane; a drainage layer (geonet); an 18-inch vegetative support layer; and, a 6-inch erosion layer.

The landfill may use on-site or off-site borrow material for the low permeability layer. The low-permeability layer will consist of no less than 18 inches of clay material having permeability no greater than 1×10^{-5} cm/sec. In order to assure that the material meets the established criteria, the material will be tested prior to use and after placement. Testing requirements will be outlined in the final closure plan. Construction methods for the compacted clay liner shall be based upon the type and quality of the borrow source and shall be verified in the field by constructing test pad(s). A Professional Engineer shall certify that the compacted clay liner installation conforms with the plans approved by the NC DEHNR Division of Solid Waste Management.

The erosion layer shall consist of 24 inches of cover soil of which no less than six inches of earthen material that is capable of sustaining native plant growth. The landfill anticipates use of on-site borrow material suitable for the erosion layer.

The material of the erosion layer will be selected considering: soil type, nutrient levels, pH, erodibility, and other factors. The vegetation should be selected based upon:

- Species of grasses which are locally adapted and resistant to drought or temperature extremes;
- Having roots which will not disrupt the low permeability layer;
- Ability to thrive in low nutrient soil and develop a good stand to resist erosion;
- Survive and function with little or no maintenance.

All cover material will be free of putresible material, solid waste, vegetation, rocks, construction debris, frozen soil, and other deleterious materials.

6.3 Final Contour Requirements

The final contour requirements for closure are shown on the drawings. These contours have been established to reflect all municipal solid waste expected to be received, intermediate cover material (representing a total of 12 inches), and the final cover system (representing a total of three and one-half feet).

6.4 Cap System Material Requirements

Based on 18 inches of clay placed over the 51 acres that require final closure, 126,000 cubic yards of low-permeability clay are required for the first layer of the cap system. Additionally, 126,000 cubic yards is required for the vegetative support soil. An estimated 42,000 cubic yards of earthen material is required for the 6 inches of top soil layer. An estimated 2,270,000 square feet of geomembrane will be used in final cover of this phase.

6.5 Drainage Control Measures

The landfill is designed to have top slopes of 8 percent and side slopes of 25 percent. Final contours have been established to allow the landfill to drain while limiting erosion potential and maintaining post settlement slopes greater than 5 percent. Surface water

will sheet flow down each of the sideslopes, and into terrace perimeter drainage ditches which will direct flow via down chutes to sedimentation basins located around the unit.

6.6 Permanent Erosion Control Measures

The landfill is situated near North Buffalo Creek at the northern side of the property, which is a tributary to the Haw River. As shown in the Drawings, a system of drainage channels and sedimentation basins will be used to protect the North Buffalo Creek from sediment laden runoff. The sedimentation basins are designed to control the 24-hour/25-year storm event and achieve a minimum of 70 percent efficiency in settling a sediment particle with a diameter of 40 microns. The sedimentation basin design calculations may be found at the end of this application.

6.7 Settlement Subsidence and Displacement

Landfill compaction methods which include the use of steel-wheeled compaction equipment to spread and compact in layers not to exceed two feet in thickness, combined with an adequate number of passes over each layer of waste, will be utilized to reduce voids and minimize differential settlement. Proper placement of daily, intermediate, and final cover will reduce the moisture content of the waste prior to site closure and further reduce settlement. Final slopes of the landfill have been developed to allow for this anticipated subsidence so that positive drainage of the fill will not be hindered.

6.8 Leachate Control

The installation of the final cap system over the fill area will greatly reduce infiltration of surface water and lessen the potential for leachate generation. The landfill has a comprehensive surface and groundwater monitoring program to detect any potential leachate migration problems. This program will be continued throughout the post-closure care period.

6.9 Gas Collection/Venting System

A passive gas venting system will be installed under the cap to allow movement of gas generated from the completed fill area to the gas management area.

6.10 Schedule for Closure

The closure will begin after completion of a portion of the final grades but no later than 30 days after the final receipt of waste. The design of the landfill in combination with the maintenance plan should assure a fairly uncomplicated closure period. The closure of the entire unit, or portions thereof, will be completed within 180 days unless an extension has been requested and received due to changes in the anticipated schedule.

6.11 Notice of Closure and Date of Final Waste Acceptance

A sign indicating the anticipated date of closure and the date of final waste acceptance will be conspicuously posted at the facility at least 30 days in advance of closure. The landfill may take other steps to notify the public of the planned closure. Prior to beginning closure of the unit or portions thereof, the Department of Solid Waste Management will be notified that a notice of intent to close has been placed in the operating record.

6.12 Implementation of Closure Plan

The closure plan will be implemented no more than 30 days from the date of final waste acceptance and completed in accordance with State regulations.

6.13 Closure Verification

The following procedures will be implemented following closure.

- A Construction Quality Assurance (CQA) report shall be submitted to the NC DEHNR Division of Solid Waste Management. This report shall describe the observations and tests used before, during, and upon completion of construction to ensure that the construction materials meet the cap design specifications and the construction and certification requirements. The CQA report shall contain as-built drawings.

- A signed certification from an independent registered professional engineer verifying that closure has been completed in accordance with the closure plan will be submitted to the NC DEHNR Division of Solid Waste Management.

- At least one sign notifying all persons of the closing of the phase and that wastes are no longer accepted will be posted. Suitable barriers will be installed as necessary at former accesses to prevent new waste from being deposited.

- Within 90 days, a survey plat, prepared by a professional land surveyor registered by the State, indicating the location and dimensions of landfill disposal areas, will be submitted to the circuit court clerk of the City of Greensboro.

- A notation shall be recorded on the deed notifying any potential purchaser of the property that the land has been used as a solid waste management unit and that future use is restricted under Paragraph (8) of Rule .1627. A copy of the deed notation as recorded shall be filed with the operating record.

SECTION 7.0
POST-CLOSURE PLAN

7.1 Introduction

This Post-Closure Plan has been developed to outline steps to be taken to ensure the environmental soundness of the landfill during its post-closure care period. The post-closure care period will last at least 30 years after closure completion and at a minimum will consist of the following:

- Maintaining integrity and effectiveness of final cover system
- Performing groundwater and surface water monitoring
- Maintaining and operating a gas monitoring system
- Maintaining run-on/run-off controls

No wastes will remain exposed after closure of the unit. Access to the closed site by the public or domestic livestock will not pose a health hazard.

7.2 Post-Closure Contact

All correspondence and questions concerning the post-closure care of the unit should be directed to:

Mr. Dale James
Solid Waste Manager
City of Greensboro
P.O. Box 3136
Greensboro, NC 27402
(910) 373-2035

7.3 Description of Use

After filling operations cease at Phase III of the White Street Sanitary Landfill and the unit is officially closed in accordance with the Plan described in Section 7.0, the area will be allowed to return to its natural vegetative state.

7.4 Maintenance

7.4.1 Repair of Security Control Devices

All security control devices will be inspected and maintained as necessary to ensure access to the site is controlled. Locks, vehicular gates and fencing will be replaced if functioning improperly. Warning signs will be kept legible at all times and will be replaced if damaged by inclement weather or vandalism.

7.4.2 Erosion Damage Repair

If erosion of the final cover occurs during post-closure, the affected area will be repaired and reseeded as necessary. Excessive slopes will be flattened if possible by adding clean fill material. If necessary, erosion control fabrics will be used to expedite rapid re-vegetation of slopes and to secure topsoil in place. Rough surfaces which cause isolated erosion areas will be smooth and reseeded as necessary.

7.4.3 Correction of Settlement, Subsidence and Displacement

Minimum slopes of five percent will be maintained after settlement in order to prevent ponding and allow for proper drainage without infiltration. If vertical or horizontal displacement occurs due to differential settlement, cracks will be filled with appropriate material and final cover will be reestablished. Excessive vertical displacement is not anticipated.

7.4.4 Repair of Run-On/Run-Off Control Structures

All terraces, ditches, and perimeter channels will be repaired, cleaned, or realigned in order to maintain original condition. Any culverts that are damaged will be replaced.

7.4.5 Gas Collection/Venting System

The landfill gas collection and venting system is anticipated to be maintained a third party. Proper operation of the systems will be verified through testing at the landfill gas monitoring wells and probes.

If methane gas recovery wells do not function as a result of irregular settlement, accumulation of liquids (condensate, leachate, water), binding or corrosion, replacement wells can be installed if necessary. Non-functioning vents will be reset if necessary.

7.4.6 Groundwater Monitoring System

All groundwater monitoring wells have been installed with concrete pads and protective casings to prevent accidental damage by vehicles and equipment. The wells are also equipped with a locking cap to discourage vandalism. Groundwater wells will be inspected regularly (at the time of sampling) to ensure integrity. Persons inspecting a well should look for signs of well tampering, cracking or degradation, and determine whether the well needs to be replaced. If the decision is made to replace and abandon a well, the replacement well should be installed 5-10 feet from the abandoned well in accordance with previous well specifications. Well abandonment should be accomplished by pulling the casing out and grouting the hole.

7.4.7 Leachate Collection System

The leachate collection system will be monitored. The leachate production rates are expected to be reduced significantly following capping. After six months of minimal flows the storage tank system may be evaluated for decommissioning and leachate will be pumped directly into the discharge line from the pump station. The tanks and pipe system will be annually inspected and repaired as necessary.

After closure of the landfill areas has been achieved, the generation of leachate will eventually curtail. The flow rate immediately after closure should decrease to 20 gallons/acre/day (gpad) which for all disposal areas yield approximately 800 gallons/day. Toward the end of the 30-year post-closure period, the flow should approach zero, at which time the storage tank will not be required. The following procedures will be followed to properly close the storage tank:

- Completely drain and remove all liquids, sludges, sediments, etc., from the storage tank.

- Disassemble the tank, piping, and appurtenances and dispose of the contents in a manner approved by NC DEHNR.

- Sample and analyze the soil for appropriate constituents inherent to leachate. Assess the results for evidence of contaminant migration.

- If contamination of underlying soil is exhibited, perform an assessment as to the degree of contamination and develop remedial actions.

- Obtain approval from NC DEHNR for the assessment and associated remedial measures.

- Perform the remedial actions as necessary to limit any threats to public health and the environment.

- Restore the area to closely match pre-existing conditions in the vicinity of the impoundment. Activities may include: filling, grading, topsoiling, and seeding.

7.5 Monitoring Plan

The closed unit shall be monitored for a minimum of 30 years. A series of inspections shall be scheduled to ensure the integrity and effectiveness of the cap system, storm water control system, groundwater monitoring system, gas collection system, leachate collection system, and to protect human health and the environment.

7.5.1 Inspection Frequencies

Inspections to be conducted during the post-closure care period will occur regularly as follows:

Inspection	Frequency
Security Control Devices	Quarterly
Cover drainage system functioning	Semi-annually
Gas collection/venting system	Semi-annually
Groundwater monitoring system	Semi-annually
Erosion damage	Quarterly
Cover settlement, subsidence and displacement	Semi-annually
Vegetative cover condition	Quarterly
Stormwater control system	Quarterly
Benchmark Integrity	Quarterly
Leachate Collection System	

A copy of the Post-Closure Inspection Checklist is shown as Figure 7-1.

7.5.2 Quarterly Inspections

Quarterly inspections of the closed site will include examining the security control devices for signs of deterioration or vandalism to ensure access to the site is limited to authorized persons. The previous disposal area will be checked to ensure that the integrity of the final cover system is maintained, erosion damage is repaired, vegetative cover persists, and that cover settlement, subsidence and displacement are minimal. Drainage ditches will be cleared of litter and debris and benchmark integrity will be noted and maintained.

7.5.3 Semi-Annual Inspections

Semi-annual inspections of the site during the post-closure period will be conducted by the City of Greensboro's consultant engineer with detail attention paid to integrity and drainage of the final cover system and proper functioning of the groundwater and gas monitoring systems.

FIGURE 7-1

POST-CLOSURE INSPECTION CHECKLIST

Date: _____ Time: _____

Weather: _____ Completed By: _____

	Yes	No
I. Security Control Devices:		
Are security control devices in place and functioning?	☐	☐
Are all warning signs prominent and legible?	☐	☐
Are there any signs of unauthorized entry on the site?	☐	☐
Are there signs of illegal dumping on site?	☐	☐
II. Final Cover System:		
Is the final cover free of erosion and depressions?	☐	☐
Is there leachate seeping from the final cover? (If yes, make note of location on comment section below.)	☐	☐
Is the vegetative cover continuous and in good condition, free of bare spots?	☐	☐
Does the site require mowing? (If yes, mow grass and note in comment section below.)	☐	☐
Is there ponding of water on final cover system?	☐	☐
III. Gas Collection System:		
Are the casings in good repair and secure?	☐	☐
IV. Groundwater Monitoring Wells:		
Is the casing upright and unobstructed?	☐	☐
Is the outer casing secure and locked?	☐	☐
Is the ID tag present and legible?	☐	☐
V. Leachate Collection System:		
Are the cleanouts accessible and secured?	☐	☐
Are the valves operational?	☐	☐
Are the tanks and pipelines free of signs of leakage?	☐	☐
VI. Miscellaneous:		
Are all benchmarks visible and intact?	☐	☐
Are all ditches free of debris and litter?	☐	☐
Are any odors present which may indicate landfill gas migration?	☐	☐

Comments

Please use the section below to comment on any area not covered above and also note any areas of concern or needing immediate attention.

Groundwater monitoring will continue on a regular basis throughout the post-closure care period. The parameters chosen for analysis will be no less than the requirements of regulatory agencies. Groundwater monitoring wells will be inspected in accordance with the Ground-water Monitoring Plan. A report of the findings will be sent to City of Greensboro representative via the Post-Closure Inspection Checklist including any recommendations for actions necessary to ensure the site continues to meet the closure performance standard. The engineer will also receive copies of the quarterly inspections reports and respond to any comments that demand immediate attention.

Gas migration will be monitored using an explosimeter around the perimeter of the fill area and between the fill and adjacent buildings and property lines. Monitoring will take place at least quarterly for safety purposes. If it is determined that an active gas venting system is required to control migration, a system including final gas treatment and disposal will be incorporated.

7.6 Engineering Certification

Based on the City's monitoring reports and an engineer's quarterly site visits, annual certifications by the engineer will be placed in the operating record. They will certify that the closure plan has been followed, noting discrepancies along with the corrective actions undertaken. At the end of the post closure period, the individual certifications will be compiled into a final document and forwarded to the Division.

SECTION 8.0
CLOSURE, POST-CLOSURE COST ANALYSIS AND SUMMARY

8.1 Introduction

The purpose of this section is to provide a written estimate in current dollars of all activities and costs associated with all activities specified in the written closure and post-closure plans which have been developed for the City of Greensboro's White Street Sanitary Landfill Phase III (see Sections 6.0 and 7.0). This cost estimate for closure and post-closure care is submitted in compliance with Rule .1628.

8.2 Estimated Closure Costs

Table 8-1 summarizes the estimated costs for the largest area requiring a final cover. This cost estimate is based on a third party providing the necessary services and includes labor in the unit prices given. The estimated closure costs will be reviewed annually or updated as required to reflect adjustments for inflation, rising costs of anticipated closure care, increased costs in construction or materials, or any other adjustments to the Closure Plan described in Section 6.0.

8.3 Estimated Post-Closure Costs

Table 8-2 summarizes the estimated costs for the White Street Sanitary Landfill Phase III post-closure care maintenance activities. This cost estimate is based on a third party providing the necessary services and includes labor in the unit prices given. The estimated post-closure costs will be reviewed annually or updated as required to reflect adjustments for inflation, rising costs of anticipated post-closure care, or any other adjustments to the Post-Closure Plan described in Section 7.0.

TABLE 8-1

CITY OF GREENSBORO WHITE STREET LANDFILL, PHASE III
COST ESTIMATE FOR CLOSURE OF THE UNIT
(BASED ON 51 ACRES)

Item	Quantity	Unit	Unit Cost	Total
Construction:				
Geomembrane (60 mil HDPE)	2,270,000	SF	$0.50	$1,135,000
Geonet Drainage Layer	2,270,000	SF	$0.50	$1,135,000
Infiltration Layer (18 inches):				
Transportation (20 miles @ $2.00/mile/load)	12,600	Load	$40	$504,000
Material	126,000	CY	$3	$378,000
Placing/Grading/Compaction	126,000	CY	$4	$504,000
Vegetative Support Layer (24 inches):				
Transportation (20 miles @ $2.00/mile/load)	16,800	Load	$40	$672,000
Material	168,000	CY	$3	$504,000
Placing/Grading/Compaction	168,000	CY	$4	$672,000
Seeding and Mulching	51	AC	$1500	$76,500
Backfill/Grading/Drainage	1	LS	$100,000	$100,000
Methane Gas Control:				
Wells (1/acre)	51	EA	$1,000	$51,000
Subtotal				$5,731,500
Contingency (20%)				$1,146,300
CQA	52	AC	$5,000	$255,000
TOTAL CONSTRUCTION				**$7,132,800**

Note: These estimates are for a third party and include labor and installation.

TABLE 8-2

CITY OF GREENSBORO, WHITE STREET SANITARY LANDFILL, PHASE III
ESTIMATED AVERAGE ANNUAL POST-CLOSURE COST
(BASED ON 51 ACRES OF PERMITTED AREA)

Item	Quantity	Unit	Unit Cost	Total
Post-Closure Costs:				
Engineering Certification	1	LS	$10,000	$10,000
Site Inspection and Recordkeeping:	160	HR	$75	$12,000
Cap Maintenance:				
Mowing (3 times per year)	52	AC	$100	$5,200
Gates/Fences	1	LS	$500	$500
Erosion and Access Control	1	LS	$5,000	$5,000
Surface Water Control	1	LS	$1,000	$1,000
Seeding	1	LS	$2,500	$2,500
Monitoring:				
Methane Gas Monitoring and Report (quarterly)	1	LS	$8,000	$8,000
Groundwater Sampling/Lab and Report (semi annual)	11	Well	$3,000	$33,000
Monitor Well Maintenance	1	LS	$1,200	$1,200
Methane Gas System Repairs	1	LS	$3,000	$3,000
Subtotal				$81,400
Contingency (20%)				$16,280
AVERAGE ANNUAL COST				**$97,680**

Note: These estimates are for a third party and include labor.